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## ‘INVENT - REINVENT ITAJIME’ DIGITAL CREATED BOARD CLAMPING

Dr Kate Wells

*School of Art, Design and Technology*

*University of Derby*

*Derby*

*UK*

### **Abstract:**

Across the world the ancient technique of board clamping, as a patterning technique for silk fabric has been constantly invented and reinvented, but over the last few centuries its use has declined to almost extinction. The history and origins of the technique is an enigma as there are examples in Japan that date from the 8<sup>th</sup> Century but subsequent examples are very scarce until a re-appearance of the technique in Japan in the 19<sup>th</sup> Century.

Today with the advances in laser cutting and CNC woodworking there is scope for its reinvention and a revival. These machines can be employed to replace the woodcarvers' skill that was once needed for the creation of matching wooded plates, whereas the process of coloration returns back to the hand of the dyer. It is a case of technology meets hand, to create uniquely patterned one-off fabrics. Pairs of precision cut clamping boards made to fit perfectly together unite with the dyeing process creating a randomness that allows variability and creativity within the technique, imparting a uniqueness within the final silk fabrics produced.

### **1 Introduction: Historical Context.**

The resist patterning technique *itajime* or clamped resist at its most basic level is quite simple and direct but at its highest levels of development required complex patterning and carving skills. As one of the rarest forms of resist patterning, clamp resists require neither the pastes or waxes of batik nor the bindings of tied and stitched resists, but instead involve folding cloth in two or more directions and clamping it between boards or sticks. [1] After dyeing nothing needs to be removed although the preparation of the traditional boards requires skill and labour, which was only justified by their durability and the ability to repeat the design again and again. The soft edged but ghostly images produced are found in no other resist or print media. Usually but not always, the motifs are negative in the shade of the un-dyed cloth; the one colour is that of the dyed ground. The exception being some older examples of this technique that were produced in three or four colours, often employing more than one set of blocks that required precise registration to achieve the effect. [2]

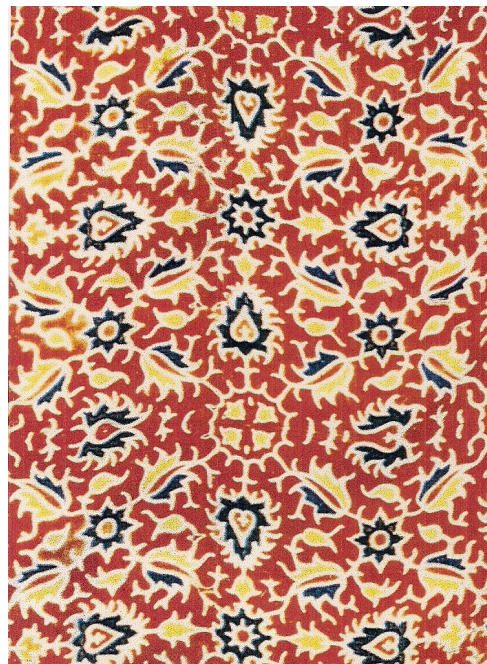
The Japanese term *itajime* literally means 'board clamping' [3] *ita* (slab) and *shimi* or *jime* means clamp. This technique involves the process of folding cloth in two or more directions and clamping it between boards or sticks. In its simplest form the boards and sticks remain plain and the pattern that is created is caused by the penetration of dye into the exposed folds of cloth. In its more advanced form, thin wooden perforated boards or blocks, carved with identical patterns are employed, but not in the same manner as wood block printing, where the raised area takes the colour which is directly transferred to the surface of the cloth creating a 'positive' image. This technique utilises a 'negative' method where folded fabric is laid in-between two carved boards or blocks in which the design on each board matches the other precisely. During the dyeing process great pressure is applied to them through various clamping techniques, which prevents any dye penetrating the raised areas of the design. The dye instead seeps through the lower levels producing mirror image patterns on a dyed ground. [4]

Buhler in his small book 'Clamp Resist Dyeing of Fabrics' [5] provided a complete record and discussion of the origins and diversity of this patterning technique throughout the world. In it he

discusses the earlier Chinese term *Kyokechi* also used to define this technique, which is thought to have been in use during the T'ang period (618-906 AD). Most of the preserved fabrics found in Chinese Turkistan and Japan (Shoso-in Treasure House in Nara) belong to this time, which as one of China's periodic cultural and political zeniths. The clamping techniques employed during this period can only be surmised by careful examination of surviving fabrics which are mostly made from cultivated silk, it appears that by folding the cloth in half or quarters produced symmetrical designs as many existing *kyokechi* appear to have been folded in this manner. By employing loosely woven or thin fabrics many layers could be clamped at a time, facilitating mass production. The only minor draw back with employing this technique seems to be that the area where the boards met was always reserved in white. A design problem that appears to have been more than compensated for by the ease with which the dyer could repeat large-scale designs in any number of colours. (Figure 1.) [5]



Silk Fabric patterned with *Kyokechi*  
Clamping Boards  
Japan  
Nara Period.



Silk Lining of a Chinese Bedspread.  
Origins thought to be Indian c1500

Figure 1.

From China, clamped resists spread to Japan, Central Asia and even Europe where they are likely to have been produced locally under Chinese influence. In Japan, patterned textiles employing this technique gradually declined during the Heian period (794-1185 AD), the reason for which is uncertain. The carved boards were difficult to make but no more than the stencils employed in the *katazome* technique. It is more likely that changes in fashion with a rejection of things Chinese and the replacement of the complex woven and dyed fabrics with solid coloured cloths led to its demise. [4] The process of clamped resists degenerated and then vanished only to reappear during the 19<sup>th</sup> Century in a simplified and slightly altered form known as *itajime*. Clamped resists in Japan are thought to have been revived or reinvented in 1837 by Tomoshichi Miura in Yamato near Nara, and were used to resist dye warp and weft threads. [4] The process became known as *itajime gasuri* (*kasuri*, *gasuri* means an *ikat* like pattern). With this technique yarns were passed between two boards engraved in high relief and, when immersed in a dye-bath, the dye was unable to penetrate to the areas under pressure. [6] By 1958 this technique, in turn, was almost extinct. At the time carved

itajime boards were still being employed to dye silk fabrics with red and white designs, to be used as kimono linings and innerwear but it is thought that further development through the simplification of the patterning technique did not fully happen until the advent of synthetic dyes. The main explanation for this is the observation that natural indigo will not penetrate well through the large amounts of folded fabric necessary for this method of patterning but chemical dyes penetrate well, bleeding into soft beautiful shapes. [Error! Bookmark not defined.]

In Europe with the onset of the industrial revolution, during the latter half of the 18<sup>th</sup> and early 19<sup>th</sup> Centuries, patterning machines that applied this basic principle were developed to increase production and aid the mechanisation of many hand processes.

One technique allied to *Kyokechi* was the Golgas method, named after a German printer working in Normandy in 1762. The machine known as a Gallegas employed identical matching engraved wooden boards to dye flannel under pressure with a variety of colours at once. Dye was often mixed with a mordant prior to being applied to the plates where each colour had its own channels in which to run to the clamped fabric. The resulting design tended to have blurred outlines. [7] Another was invented in 1802 by the Scotsman Monteith, in an attempt to copy the red and white spotted bandannas exported from India that were so popular at the time. He developed a technique of destroying the red dye (Turkey red), back to the base white thus creating white patterns on a red ground. For this madder dyed cotton was layered between two identical cast lead plates, both of which were perforated with the same pattern, this was the birth of the bandana handkerchief. [8]

## 2 Traditional Materials and Methods

Historically *Itajime* or older technique of *kyokechi* was created using carved boards or blocks. They vary in size but those that still survive from Japan are normally found to be one of three common forms; all are rectangular slabs between 27- 47 cm long and 22cm wide and no more than 1cm thick. They are made out of a hard wood that does not warp and has usually been lacquered to prevent dye penetrating the wood. Some are carved on both sides, some only on one (which necessitates twice the number of boards). Some have no carving on the edges, which gives a characteristic line of plain dyed fabric from the space created between the two boards. Others have carved edges, or were dyed with a separate edge piece added. [Error! Bookmark not defined.] Each board is carved on one side with a mirror image of pattern that exactly matches the carving on another board thus acting as a pair, in the areas of carving; holes are drilled through the boards facilitating the passage of the dye to the clamped fabric held between the boards. The design tended to be carved out of the boards creating a coloured design on a white background once the fabric was dyed the dye solution passing through holes in the motif areas; the opposite, in which a white design is created on a coloured background, is produced using two boards in which only one of the pair is carved, the other remains smooth. The fabric to be patterned is carefully laid out on the smooth board and the relief board laid on top and firmly clamped. Dye (mostly blue, indigo) was then poured along grooves on the outer surface and through holes in the carved upper board. After sometime the boards are turned over so that any superfluous dye can run off. [Error! Bookmark not defined.]

Traditionally the fabric that was to be patterned was folded three or four times, depending upon its thickness, before clamping between single pairs of boards or blocks. Thus mirror image patterns of considerable complexity were created once the fabric had been dyed and unfolded. If a design of more than one colour were to be created, the fabric would remain folded after the first dyeing procedure and would then be re-clamped using a different set of boards. This would be repeated with other boards if more colours were required. The use of different boards one after another was possible without great risk as the designs covered a large area and motifs would often run into each other. It does however require great care. [Error! Bookmark not defined.]

Single pairs of boards are normally employed along the length of a cloth but with the technique of



*itajime gasuri* (the clamping of warp and weft threads) the boards were carved in series, on both sides, thus requiring a stack of up to a hundred boards for one design. The pattern would often alter from the face to the back of the board creating a larger repeat in the finished fabric. Two diagonal and a third perpendicular registration grooves are often found on the edges to assist in accurate alignment of the boards. A series of boards would start with these diagonal grooves at the outer edge on the first board of the series, which would slowly move inwards as the stack of boards grew, forming a triangle once all the boards were in the correct position and fully aligned.

The designs carved into the boards for this technique are at their simplest a series of grooves and ridges cut across the width of the boards that create a series of stripes on the cloth when dyed. Traditionally others boards contained geometric, vegetative or zoomorphic motifs identical on both sets of board except for the fact that one is the mirror image of the other which allowed them to match perfectly when clamped.

## 2.1 Case study: The use of Itajime from Kimono to Couture

As a technique, *itajime* is no longer employed industrially with the exception of the Japanese craftsman, Norio Koyama, who is the only remaining craftsperson in Japan to employ the traditional process of *itajime gasuri* (the utilisation of identically carved wooden boards to resist pattern fabrics) on a commercial level. As a silk weaver, Norio Koyama, became interested in the process of *itajime gasuri* having purchased the last remaining full set of traditional clamping boards. Teaching himself the intricate and precise processes involved with this type of resist patterning; the arrangement and dyeing of warp and weft threads and the precise weaving required to produce lengths of fabric with patterns similar to double 'ikat'. The silk fabrics he created using this patterning method were used to produce traditional kimonos in which he gained recognition for the fine craftsmanship and skills involved in their dyeing and weaving. Under the encouragement of a personal friend, the fashion designer Issey Miyake, Koyama started to experiment using pre-woven fabrics instead of yarn with the striped carved boards designed for *itajime gasuri*. He discovered that woven fabrics would absorb the dye in a different manner producing striped designs across the width of the cloth, if the fabric was pleated or folded, different effects could produced quite quickly. (Figure 2.) [9]



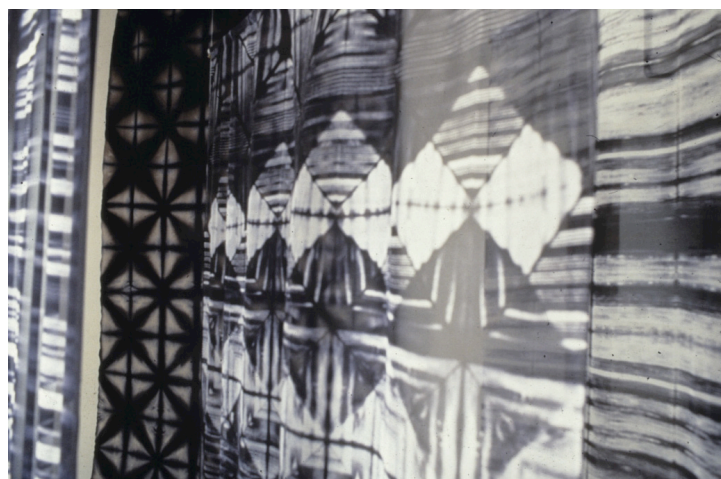
Norio Koyama dyeing with *itajime gasuri*: Clamping Boards in 1996  
Figure 2.

Koyama no longer produces the traditional *itajime gasuri* fabrics used in the creation of unique silk kimonos. This is due mainly to the slow speed and time needed in the dyeing and weaving of the

patterned threads. By 1996 he had dismantled his loom and only produced designs onto cloth. By using pre-woven fabric he is constantly re-inventing ways to employ the carved boards he has, although he does have new patterns cut, the cost and skills involved prohibits rapid change in design and denies the flexibility found with other shibori processes. A new set of boards are very expensive to have carved and would only be commercially viable if he had a large enough order to warrant the expense. The boards and clamped cloth are extremely heavy and special lifting mechanisms are required to hoist the clamped boards into and out of the dye bath. In this case the whole pile of boards and fabric are totally submerged in the dye bath or placed under a spraying mechanism, unlike the previous methods where dye was poured through holes and groves in the top board. [9]

## 2.2 Developments of the technique

In 1996 the Japanese designer Norio Koyama made a gift of eight boards to the author, this has ensured that the knowledge of such an ancient technique continued to be developed as a resist patterning technique into the 21<sup>st</sup> Century. These boards formed a major contribution to the PhD 'Resist patterning for Contemporary Fabrics' and were employed for the production of unique resist patterned design work as part of this research degree. The old Itajime boards, originally utilised to dye the warp and weft of fabrics, were employed with a fine silk organza cloth. The cloth was normally folded in half, thirds or quarters down its length to the width of the board. It was then placed between the boards in a continuous zigzag until the total length is placed between the boards. This technique produced a length of cloth with horizontal stripes across its width. But by folding the fabric in different directions geometric patterns were created, the varying thicknesses of cloth caused by the folds created variation in the pressure exerted by the boards producing a design of differing intensities of pattern and depth of colour. (Figure 2) [9]



Dr Kate Wells: Practical Research for PhD 'Resist patterning for Contemporary Fabrics'.

Figure 2

## 2.2 Advancements in the technique

With advancements in digital technology and CAM (Computer Aided Manufacture) new life could be brought to such an old resist patterning technique. These technologies can be employed to create precision clamping boards that have absolute accuracy in the matching of pairs and can be carved in a matter of hours rather than days. Laser cutting and CNC woodworking machines combined with vector digital software provides the opportunities to bring such an ancient technique into the 21<sup>st</sup> Century. Such technology can be used to accurately cut marine plywood, medium density fibreboard (MDF), acrylic sheet and Perspex that can then be used as clamping boards.

One of the main drawback is that the plywood and MDF composites that are readily available and

are easy to digitally cut, do not retain the stability properties of the slabs of wood that were originally employed with the technique. The glues that are employed in their construction can cause problems with the laser cutting process thus limiting the selection of materials to ones that do not possess the water resistant properties required for hot submersion dyeing and acrylic sheet and Perspex will often distort with the heat of the bath. If replaced by cold dyeing such as an indigo vat, the dyes do not saturate the fabric between the clamping boards to the same extent as dyeing for longer periods with synthetic dyes as the short period of time this class of dye requires to colour the fabric does not enable full penetration of dyestuff into the folds of material. To create successful patterning better results have always been achieved with hot dye processing.

### 3 Summary

Across the world the ancient technique of board clamping, as a patterning technique for silk fabric has been constantly invented and reinvented, but over the last few centuries its use has declined to almost extinction. The history and origins of the technique is an enigma as there are examples in Japan that date from the 8<sup>th</sup> Century but subsequent examples are very scarce until a re-appearance of the technique in Japan in the 19<sup>th</sup> Century. Since then the use of clamping boards as a patterning technique continued to be employed in a very limited way but the employment of patterned and carved boards was superseded in most cases by stencil and screen-printing techniques.

Today with the advances in laser cutting and CNC woodworking there is scope for its reinvention and revival. These machines can be employed to replace the woodcarvers' skill that was once needed for the creation of matching wooded plates, whereas the process of coloration returns back to the hand of the dyer. It is a case of technology meets hand, to create uniquely patterned one-off fabrics. Pairs of precision cut clamping boards made to fit perfectly together unite with the dyeing process creating a randomness that allows variability and creativity within the technique, imparting a uniqueness within the final silk fabrics produced. But complete success relies upon the material that is employed to construct the clamping board.

It is difficult to know if the technique will continue to evolve and develop as a resist patterning process or simply disappear as it has done in the past. [Error! Bookmark not defined.] As a patterning technique it was used for relatively fast mass production of designs and in the future may be employed again but on a limited scale for the production of unique one-off pieces of resist dyed fabric that are almost identical yet still different.

### 4 References

- [1] Hann, M. A, and Wells, K. **The Dyers' Craft: Resist Patterned Textiles.** Leeds, The University of Leeds Gallery. (2000) pp. 6.
- [2] Larsen, J. L. **The Dyers Art, ikat, batik, plangi.** England, Von Nostrand Rienhold Company Limited pp. 74.
- [3] Wada, Y., Kellogg Rice, M. & Barton, J. **Shibori: The Inventive Art of Japanese Shaped Resist Dyeing.** Japan, Kodansha International Ltd. (1983) pp. 116.
- [4] Leighton –White, S. Japanese Resist Dyeing.' **Textile Society.** Vol. 21 (1994).
- [5] Buhler, A & Fischer, E. **Clamped Resist Dyeing of Fabrics.** Calico Museum of Textiles, Ahmedabad. (1977) pp. 44-47, 92 -120.
- [6] Anon, Japanese Resist Dyeing Techniques. **CIBA Review**, Vol. 4. (1967), pp. 2-32
- [7] Robinson, S. **A History of Dyed Textiles.** pp. 86.
- [8] Storey, J. **Manual of Dyes & Fabrics.** London, Thames and Hudson Ltd. (1985) pp. 137.
- [9] Wells, K. **Resist Patterning for Contemporary Fabrics.** PhD. Royal College of Art (1998)

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\*Corresponding author: [k.wells@derby.ac.uk](mailto:k.wells@derby.ac.uk)